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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,098	07/23/2001	Kang-Wook Park	5649-805DV	4775

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EXAMINER

FARAHANI, DANA

ART UNIT PAPER NUMBER

2814

DATE MAILED: 07/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/911,098

Applicant(s)

PARK, KANG-WOOK

Examiner

Dana Farahani

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,5-9,27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,5-9,27 and 28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Art Unit: 2814

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admitted Prior Art (AAPA) in view of Hamasaki (U.S. Patent 4,996,581).

AAPA discloses in figure 1, a bipolar junction transistor (BJT) comprising an intrinsic collector region 13 of a first conductivity type in a semiconductor substrate 10; a trench 19 in the substrate, adjacent the intrinsic collector region; and an emitter region 41 of the first conductivity type that forms a P-N rectifying junction with the base region. AAPA further discloses, in figure 1, a first electrically insulating layer 25 and a second electrically insulating layer 37 on layer 25 having a lateral recess, as shown in the figure, that extends along an undersurface of the second insulating material, also discloses intrinsic base 43 and openings 35 and 55 in the insulating layers.

AAPA does not disclose a base electrode of a second conductivity type in a trench, and a base region of the second conductivity type that is self-aligned to the base electrode and forms a P-N rectifying junction with the intrinsic collector region.

Hamasaki discloses in figure 6 a base region 17 of the second conductivity type and base electrode 15 forms a P-N rectifying junction with the collector region 13.

Furthermore, Hamasaki discloses that this structure in combine with the structure of the

Art Unit: 2814

collector region, all in figure 6 of the reference, has a high switching speed and the parasitic capacitance between the base and the collector is reduced (see column 3, lines 6-12). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the base structure of Hamasaki in AAPA in order to increase the switching speed and reduce the parasitic capacitance between the base and the collector of AAPA.

3. Claims 1, 5-9 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Hamasaki, as applied to claim 1 above, and further in view of Lee et al., hereinafter Lee (U.S. Patent 5,506,157).

Regarding claims 1 and 27, AAPA in view of Hamasaki renders obvious the claimed invention, as discussed above, except for a trench-insulating layer disposed between the base electrode 15 and a sidewall of the trench.

Lee teaches in figure 4E a base electrode 24 surrounded by insulator 34 of figure 4D.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to dispose a trench insulating layer between the base electrode and the side wall of the trench 5 of AAPA, as Lee teaches, in order to limit the bipolar junction transistor operation to the region on top of the trench. Also, by providing the trench insulator, the parasitic capacitance between the collector and base region, which is undesirable, will be significantly reduced.

Regarding claim 5, Hamasaki discloses in figure 6, emitter 18 is self aligned to a sidewall of the lateral base electrode extension.

Art Unit: 2814

Regarding claim 6, AAPA discloses in figure 2 base region comprises an extrinsic base region 42 in the extrinsic collector 13; and intrinsic base region 43 of second conductivity type with lower doping than the extrinsic base region in the intrinsic collector region.

Regarding claim 7, AAPA discloses in figure 2, an emitter electrode 31 of the first conductivity type on the surface of the substrate and on the electrically insulating sidewall spacer 29; and Hamasaki discloses in figure 6, an insulator 14 on the sidewall of the lateral base electrode extension.

Regarding claim 8, AAPA discloses in figure 1 a buried extrinsic collector region 11 of the first conductivity type in the substrate.

Regarding claim 9, trench 19 of AAPA defines an intrinsic collector region mesa that extends between the buried extrinsic collector and the surface of the substrate.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dana Farahani whose telephone number is (703)305-1914. The examiner can normally be reached on M-F 8:00AM - 6:00PM, Est. time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703)308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9318 for regular communications and (703)872-9319 for After Final communications.

Art Unit: 2814

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

D. Farahani
July 4, 2003



LONG PHAM
PRIMARY EXAMINER